

PATENT CLAIMS

1. Mobile antenna system comprising rotary part by azimuth, which is an electronically steered in elevation phased array antenna, comprising:

plurality of (multi)layered structures, placed at certain levels, said
5 structures include microstrip antenna elements (12), feeding lines (20), which properly combine and guide the electromagnetic energy, forming the necessary phase and amplitude distribution over the antenna elements, a plurality of electronic modules (28) providing amplification, phase change, frequency conversion and steering of the received signal, power supply and control circuits
10 for the same electronic modules;

a plurality of vertical transitions (13), providing the passing of the electromagnetic energy between the layered structures from different levels;

frequency converting device and rotary joint (18), passing the received signal, the power supply and control circuits to the static part;

15 sensors detecting the spatial movement of the system, and power supply and control units;

static part, comprising bottom (10), cover (2) with radiotransparent part (1), mechanical supports, motor (11), gear, plurality of electronic modules (19,6,7);

20 2. Mobile antenna system according to claim 1, featuring first layered structure (3), forming the first level, which comprises the microstrip antenna elements (12)

3. Mobile antenna system according to claim 2, characterized by microstrip antenna elements (12) placed in cavity (21).

25 4. Mobile antenna system according to claim 1, 2 or 3, characterized by microstrip antenna elements which are dual-port.

5. Mobile antenna system according to one of claims 1 to 4, characterized by microstrip antenna elements (12) which are probe fed (22).

30 6. Mobile antenna system according to claim 5, characterized by microstrip antenna elements (12), which are capacitive probe fed (22,27).

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7. Mobile antenna system according to one of claims from 1 to 4, characterized by microstrip antenna elements (12) fed through slot (26).

8. Mobile antenna system according to claim 1, characterized by microstrip antenna elements (12) which are tilted to the observation angle.

5 9. Mobile antenna system according to claim 1, characterized by microstrip antenna elements (12) covered with dielectric layer, which could act as impedance matching for low elevation tracking.

10 10. Mobile antenna system according to claim 9, characterized by a dielectric layer carrying the antenna elements (12).

11. Mobile antenna system according to claim 1, characterized by microstrip antenna elements (12) placed in a lattice formed from the peaks of isosceles triangles (29).

12. Mobile antenna system according to claim 1, characterized by electronic tracking which is in one plane perpendicular to the rows (30) formed by one of the sides of the triangles (29), which form the lattice.

13. Mobile antenna system according to claim 12, characterized by antenna elements placed in the rows, perpendicular to the electronic tracking plane, which (elements) are placed at optimal distance regarding the effective utilization of the antenna aperture and feeding lines density (20).

20 14. Mobile antenna system according to claim 1, characterized by microstrip antenna elements (12) which are placed apart at certain places of the array in order to place mechanical supports (14) there.

15. Mobile antenna system according to claim 1, characterized by a first layered structure (3) comprising feeding lines (20), which feed sequentially several antenna elements (12) each, from one and the same row.

16. Mobile antenna system according to claim 1, characterized by a first layered structure (3) containing feeding lines (20), which feed in sequence and in parallel several antenna elements (12) each, from one and the same row.

17. Mobile antenna system according to claim 1, characterized by first layered structure (3) comprising feeding lines (20), which feed in sequence and

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in parallel several antenna elements (12) from neighbouring rows providing constant phase difference between them.

18. Mobile antenna system according to claim 1, characterized by levels which are formed by more than one similar layered structures (3,15), so as to
5 form a plurality of leveled modules (25), which are united from the lower levels.

19. Mobile antenna system according to claim 18, characterized by leveled modules, which could be tilted to the direction of observation.

20. Mobile antenna system according to claim 1, characterized by first layered structure (3) which is formed by vertically placed layers(31).

10 21. Mobile antenna system according to claim 1, characterized by first layered structure (3), which contains low noise amplifiers (28).

22. Mobile antenna system according to claim 21, characterized by next layered structures (15,5) which contain feeding lines (20), combining the groups from the first level and from one and the same row in parallel.

15 23. Mobile antenna system according to claim 22, characterized by next layered structures (15,5) also containing amplifiers (28).

24. Mobile antenna system according to claim 23, characterized by last layered structure (5) containing phase control devices.

20 25. Mobile antenna system according to claim 24, characterized by last layered structure (5) which also contains amplitude control devices.

26. Mobile antenna system according to claim 24, characterized by phase control devices which are integrated circuits.

27. Mobile antenna system according to claim 24, characterized by phase control devices which are build from discrete components.

25 28. Mobile antenna system according to claim 1, characterized by last layered structure (5) that contains feed lines (20), forming circuit, which combines parts from the different rows.

29. Mobile antenna system according to claim 24, characterized by last layered structure (5) which contains plurality of digital control units for steering of
30 amplitude (28) and phase control units.

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30. Mobile antenna system according to claim 1, characterized by feed lines (20) in the layered structures (3,5,15) which are in fact microstrip lines

31. Mobile antenna system according to claim 1, characterized by part of the feed lines (20) in the layered structures (3,5,15) which are strip lines.

5 32. Mobile antenna system according to claim 1, of which it is characteristic that at least some of the layered structures (3,5,15) are multilayer printed circuit boards.

33. Mobile antenna system according to claim 1, of which it is characteristic that at least some of the layered structures (3,5,15) are fulfilled as equal modules
10 containing one or more levels, united from the next level of layered structure.

34. Mobile antenna system according to claim 1, characterized by the connection between the feed lines (20) from the separated levels (3,5,15) is provided by a plurality of vertical RF transitions (13).

35. Mobile antenna system according to claim 34, characterized by
15 vertical RF transitions (13) which are coaxial elements, capable of surface mounting.

36. Mobile antenna system according to claim 34, characterized by vertical RF transitions (13) which are stripline elements, capable of surface mounting.

20 37. Mobile antenna system according to claim 34, 35 or 36, characterized by vertical RF transitions (13) which have supporting mechanical functions.

38. Mobile antenna system according to claim 1, of which it is characteristic that one side of the layered structures (5,15) is covered with electromagnetic absorptive coating.

25 39. Mobile antenna system according to claim 1, of which it is characteristic that the RF outputs from the layered structure (5) of the last level are connected through coaxial cables to a separate combiner.

40. Mobile antenna system according to claim 39, of which it is characteristic that the output of the said combiner is connected with the input of
30 the frequency converter.

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41. Mobile antenna system according to claim 1, characterized by leveled structure covered with cover (16), which cover is an electromagnetic shield.

42. Mobile antenna system according to claim 41, of which it is characterized by that the cover (16) has electromagnetic absorptive coating from
5 the inner side.

43. Mobile antenna system according to claim 41 или 42, of which it is characterized by that the cover (16) has supporting and carrying functions.

44. Mobile antenna system according to claim 41, of which it is characterized by that the cover (16) is mounted to the static part through rotary
10 joint (18).

45. Mobile antenna system according to claim 41, of which it is characterized by that the cover (16) comprises mounted from beneath gear (9), passing the movement from the motor (11).

46. Mobile antenna system according to claim 45, of which it is
15 characterized by that the said gear (9) is made as crown, around the periphery of the cover (16) of the rotary part.

47. Mobile antenna system according to claim 1, of which it is characterized by that the driving is provided from belt gear (8).

48. Mobile antenna system according to claim 41, of which it is
20 characteristic that the cover (2) of the antenna system has radiotransparent part (1).

49. Mobile antenna system according to claim 48, of which it is characterized by that the radiotransparent part (1) has impedance matching properties for lower elevation tracking.

50. Mobile antenna system according to claim 1, of which it is
25 characterized by that the system has satellite signals reading and recognition unit (19).